UNIVERSITY OF BOTSWANA
DEPARTMENT OF MATHEMATICS
MAT391 ENGINEERING MATHEMATICS III
2025-2026 Academic Year SEMESTER 1

NB: A STUDENT SCORING BELOW 40% IN CONTINUOUS ASSESSMENT (CA) CAN NOT WRITE THE FINAL EXAMINATION.

1. Lectures, Tutorials, and Timetable

No.	Lecturer	E-mail	Office	Remark
1	Dr. Mengistu Goa Sangago	sangagom@ub.ac.bw	232/234	
2	Dr. Eriyoti Chikodza	chikodzae@ub.ac.bw	246/S226	

LECTURE TIMES:

	DAY		TIME	ROOM	Attendees
Lecture	TUESDAY		13:00-14:00	**252/LT002**	All Engineering groups
	WEDNSEDAY		13:00-14:00	**252/LT002**	All Engineering groups
	FRIDAY		13:00-14:00	**252/LT002**	All Engineering groups
Tutorials	MAT391/TUT/01	WEDNSEDAY	14:00 -15:00	**240/009**	**TBA (Optional)**
	MAT391/TUT/02	WEDNSEDAY	15:00 -16:00	**225/002**	**TBA (Optional)**
	MAT391/TUT/03	TUESDAY	14:00-15:00	**252/117**	**TBA (Optional)**

*** Assigned Demonstrators and/or Teaching Assistants for tutorials**

2. Continuous Assessments Schedule

Assessment	Day/Date	Time	Venue
Assignment 1	Due Date: Friday 05/09/2025	15:00-17:00	232/234
Test 1	Friday 12/09/2025	18:00-20:00	252/08, 252/09
Assignment 2	Due Date: Friday 24/10/2025	15:00-17:00	246/S226
Test 2	Friday 31/10/2025	18:00-20:00	252/08, 252/09

3. **Aims and Learning Objectives**

This course introduces the students to some ideas and techniques from Laplace transformation, Fourier series, Vector Analysis and Numerical Analysis.

4. **Course Synopsis**

Laplace Transformation as a tool to solve ODEs, Fourier series representation of periodic functions, Vector analysis, Interpolation, and Numerical solution of differential equations.

5. SCHEME OF WORK

WEEK 1 **28 Jul - 01 Aug 2025**	1. **LAPLACE TRANSFORMS** 1.1. Introduction 1.2. Laplace Transform ➢ Definition and notation ➢ Laplace transforms of simple functions ➢ Properties of the Laplace transform ➢ Table of Laplace transforms
WEEK 2 **04-08 Aug 2025**	1.3. Inverse Laplace transforms ➢ Table of Laplace transforms 1.4. Solution of differential equations by Laplace transforms ➢ Transforms of derivatives ➢ Transforms of integrals ➢ Solution of first order differential equation ➢ Solution of Second order differential equation
WEEK 3 **11-15 Aug 2025**	➢ Solution of simultaneous differential equations 1.5. Laplace transform of Step and impulse functions ➢ The Heaviside unit step function
WEEK 4 **18-22 Aug 2025**	➢ Laplace transform of unit step function ➢ Laplace transforms of periodic functions 1.6. Engineering applications ➢ Electrical circuits ➢ Mechanical vibrations
WEEK 5 **25-29 Aug 2025**	**2. FOURIER SERIES** 2.1. Fourier series expansion ➢ Periodic functions ➢ Fourier's theorem ➢ Functions of period 2π ➢ Even and odd functions
WEEK 6 **01-05 Sep 2025**	2.2. Fourier Series of functions defined over a finite interval ➢ Full-range series ➢ Half-range series
Week 7 **08-12 Sep 2025**	2.3. Engineering applications ➢ Frequency response ➢ Oscillating systems

WEEK 8 **15-19 Sep 2025**	**MID-SEMESTER BREAK**
WEEK 9 **22-26 Sep 2025**	**3. VECTOR ANALYSIS** 3.1. Scalar and vector fields ➢ Scalar point functions (Scalar field) ➢ Vector point functions (Vector field) 3.2. Scalar and vector triple products 3.3. The gradient of a scalar field
WEEK 10 **29 Sep - 03 Oct 2025**	3.4. The divergence of a vector field 3.5. Curl of a vector field 3.6. Line integrals ➢ Definition of a line Integral ➢ Green's Theorem on the plane
WEEK 11 **06-10 Oct 2025**	3.7. Surface integrals ➢ Scalar Field ➢ Vector Field ➢ Conservative vector fields
WEEK 12 **13-17 Oct 2025**	3.8. Volume integrals ➢ Gauss's divergence theorem ➢ Stokes' theorem 3.9. Engineering applications ➢ Streamlines in fluid dynamics Heat transfer
WEEK 13 **20-24 Oct 2025**	**4. NUMERICAL ANALYSIS** 4.1. Interpolation 4.2. Numerical solution of equations ➢ Newton-Raphson method
WEEK 14 **27- 31 Oct 2025**	4.3. Approximate integration 4.4. Numerical solution of differential equations ➢ Euler's method ➢ Runge-Kuta methods
WEEK 15 **03-07 Nov 2025**	4.5. Applications to engineering problems ➢ Oscillations of a pendulum ➢ Heating of an electrical fuse
10-12 Nov 2025	**Reading Days (No classes, Assessments, Examinations held)**
13-26 November 2025	**Final Examinations Period**

6. **Reference/Textbooks**
   - **K. A. Stroud, Modern Engineering Mathematics, Macmillan, ISBN 0-333-62022-4**
   - **K. A. Stroud, Further Engineering Mathematics, Macmillan, 0-333-65741-1**
   - **Glyn James, Modern Engineering Mathematics, Addison Wesley, ISBN 0-201-87761-9**

7. **Teaching and Assessment**
   a. **Lectures**
      - Notes on Moodle,
      - Teams or Physical presentation at scheduled times.
   b. **TUTORIALS**
      Teams or physical presentations by Demonstrators and TAs
   c. **ASESSMENT**
      - **Continuous assessments (CA) (300 marks)**
        - ✓ Two Assignments (100 marks)
        - ✓ Two Tests (200 marks)
      - **Final Examination (EX) (100 marks)**
      - **Final Mark**

$$\boldsymbol{FM = 0.5 * (CA \div 3) + 0.5 * EX}$$